Allis-Chalmers Co

Mining Machinery Department

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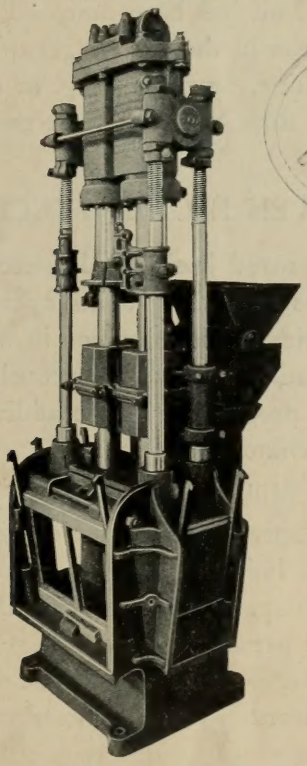
TREMAIN STEAM STAMP



THE TREMAIN STEAM STAMP MILL

Height, 7 feet 6 inches. Base, 23½ x 21½ inches.

Battery Screens used on front and ends of mortar.

MILWAUKEE, WISCONSIN, U. S. A. By Allis-Chalmers Company

THE INITIAL DEVELOPMENT OF PROMISING CLAIMS

There are, in all mining countries, hundreds of promising claims in the hands of parties who are not able to expend the thousands of dollars necessary to develop their properties into paying and salable mines, and who do not feel justified in undertaking the erection of a five or ten-stamp mill, knowing, as they do, that the first cost of such machinery is only a fair start toward the installation of the mill and placing it in readiness to run—it being a fact that the cost of erection is often more than twice the cost of machinery.

In the event of disappointment in meeting expectations in development, such a plant would be largely a fixture, and would probably stand as an evidence of failure, because the money spent in its erection would necessarily be lost in moving the machinery to other mines, where possibly the same experience might be repeated.

WHAT THE TREMAIN STEAM STAMP IS DESIGNED FOR

The Tremain Steam Stamp Mill has been designed especially to meet the demands of those who own mining properties in the first stages of development, enabling them to establish a thoroughly good crushing, amalgamating, or concentrating plant of moderate capacity, in the shortest possible time, with the least material, and for the least money.

HAS PROVEN HIGHLY SUCCESSFUL

The machine has not only proved itself highly successful for this purpose, but has shown an economy in all matters pertaining to its operation which is remarkable, and which compares very favorably with results obtained in works of larger capacity, showing that the original plant can be readily and advantageously augmented from time to time as the development of the mine progresses, by the addition of more machines, at a cost of little more than that of the machines themselves.

The Tremain Steam Stamp Mill has long since passed the experimental stage and become a well-recognized modern specialty in the list of machinery devoted to the reduction of ores. Its success has inspired imitations which, in some instances are infringements of the rights of Allis-Chalmers Company, the owners of the patents, and will be so treated. All attempts to entirely avoid the patented features have, so far, been futile and it is reasonable to assume that purchasers prefer a machine with a successful record to one that is lacking in any of its best features or embodies them in defiance of patent rights.

SAVES MONEY ON FIRST COST, FREIGHT AND IN ERECTION

The first cost of a Tremain plant is small, and the saving in freight charges is great. The cost of erection is little, four to eight days being sufficient in which to put it into operation after the machinery has been delivered on the ground; and in the event that the prospect does not "hold out" or pay to work, the owners have only to loosen a few bolts, disconnect a few pipes, and load the "plant" for transportation to newer or better fields.

CONSTRUCTION AND ACTION OF THE TREMAIN STAMP

The machine is entirely "self-contained," and may be described as consisting of two stamp stems, the upper ends of which terminate in pistons, working in cast-iron cylinders after the manner of the steam engine. These pistons are turned out of the solid forging, which forms the stamp stems, and are fitted with two sets of piston rings, making them steam tight.

The piston rods which pass through the stuffing boxes are slightly smaller in diameter; therefore, the steam pressure which is admitted under the piston to raise the stamp, is confined to an area which is the difference between the diameter of the piston and the piston rod, amounting to an annular ring about three-quarters of an inch wide. This area is small, but sufficient to quickly raise the stamps, the total weight of which is but four hundred and fifty pounds.

Either piston in its travel toward the top of its cylinder passes a small steam port, which admits the pressure to the valve mechanism and moves the valve to its opposite position; the movement of the valve cuts off the admission of steam to the underside of the piston, and admits to the underside of its mate, at the same time connecting the top and bottom ends of the first-mentioned cylinder, thus allowing the confined steam, which is holding the stamp up, to be expanded around the piston to its upper side, and acting expansively upon the large area encountered, to so energetically assist the 450 pound stamp in its downward movement as to strike a blow upon the die equal to that of an 800 to 1,000 pound gravity stamp. The pistons alternate with each other perfectly, and when the valve is moved back to again admit steam to the underside of the first-mentioned piston, it also connects the top side with the exhaust port, so that the steam remaining after the blow has been struck is passed into the atmosphere. This arrangement makes it possible to use the steam expansively, and to obtain the same crushing effect with each drop of the 450 pound stamp as would be obtained with a gravity stamp of 800 to 1,000 pounds dropping eight inches (depending upon the pressure used). Instead of being limited to about 90 drops per minute, as with the gravity stamp, it is possible to obtain a speed of 200 or more drops per minute of each stamp, and it will be obvious that the crushing capacity must be correspondingly increased.

NO FRAMEWORK REQUIRED

The machine is complete in itself, weighs but 4,400 pounds, and, being built entirely upon the mortar, it requires no frame work of any kind in its erection other than a substantial mortar block.

CAPACITY

The capacity of the mill will vary with the character of the ore, and size mesh of the screens in use, from eight tons under the most adverse circumstances to twenty tons when stamping friable ore.

EIGHT TO EIGHTEEN TONS DAILY

Experience has shown it to be safe to calculate that the Tremain Mill will pulverize from eight to eighteen tons of ordinary gold quartz, through forty mesh screen, in twenty-four hours.

SMALL POWER NEEDED

The steam power required to operate the mill will vary with the speed at which it is run, from about seven horse-power to fifteen horse-power, or ABOUT THE SAME AS FOR ONE STEAM ROCK DRILLING MACHINE.

FUEL AND WATER REQUIRED

One or two cords of good, dry pine wood is all that is ordinarily required to operate the mill for twenty-four hours.

The water required for use with one mill and boiler is about 800 gallons per hour. Provision should be made for supplying 1,000 gallons per hour if the water is available.

SECTIONAL MILLS

These machines are manufactured with either solid or sectional mortars, the latter for mule-back transportation; no piece of the sectional mill weighs more than 340 pounds.

AS TO BOILERS

The boilers ordinarily specified are of the semi-portable locomotive type on skids and, like the mill, are very quickly set and connected ready to operate. Sectional horizontal tubular boilers can be furnished when it is necessary to carry the machinery over the mountain trails on pack animals.

SPEED AND STEAM PRESSURE

The speed of the machine is variable at will, that being a matter depending entirely upon the pressure used. Approximately it is as follows: With 60 pounds pressure, 140 drops; with 80 pounds, 180 drops; with 100 pounds, 200 drops per minute of *each* stamp, etc. Increasing the pressure increases the speed, and vice versa. It is customary to carry about 100 pounds of pressure at the boiler, and maintain a speed of about 200 drops per minute. It is desirable that the Tremain Mill be situated as closely as convenient to the boiler. Carrying steam long distances effects a loss of pressure and entrains water which materially affects the operation of the machine, reducing speed and effectiveness. To get the best results, 100 pounds Dry Steam pressure must be maintained at the mill.

THE MILL AN EXCELLENT AMALGAMATOR

The mill is an excellent amalgamator. It is provided with silver-plated lip plates on the mortar, which take the place of the inside coppers; these lip plates retain amalgam exceedingly well, are always in sight and are a perfect index of the conditions inside of the mortar and for feeding quicksilver.

LARGE SCREENING CAPACITY

The screening capacity of the mill is relatively large, there being 417 square inches of effective surface provided in the mortar, and because of the very rapid movement accomplished by the steam-driven stamps, a much greater agitation of the pulp in the mortar is kept up, and a much greater height of the screen surface is made available for the discharge of the pulp.

PARTICULARLY ADAPTED TO CONCENTRATION WORK IN PLANTS OF SMALL CAPACITY

Owing to the high speed and greater agitation of the pulp in the mortar of the Tremain Mill there is a lesser percentage of "slimes," produced than in any other mill, which fact makes the machine particularly adapted to concentrating propositions. When installed for this work and arranged with engine, boiler, crusher, classifier, jigs and vanner, in the Allis-Chalmers layout, it makes the cheapest and most economical 25-ton concentrating plant in the market, and like the Tremain Gold Mill, it requires much less expenditure in its erection and operation than any other combination of machinery for like purpose that can be had.

The large single and compound steam stamp has long been a favorite as applied to coarse concentration, but, being of very large capacity, it is suitable only for works of the largest size. The Tremain Steam Stamp has all the advantages to be derived from the sharp and rapid blows, and is of a size exactly suited to the needs of mining men whose ores are too poor to ship, or whose mines are not sufficiently developed to warrant the immediate installation of a large concentrating plant.

CONCENTRATION AFTER AMALGAMATION

Concentration after amalgamation is practiced with the Tremain Mill as with the gravity mill, and is assisted by the fact that the Tremain product is much less charged with slimes than in the case of the ordinary stamps.

FEEDER

The Tremain Mill may be fed by the regular Challenge or Tulloch feeder, but a special feeder has been designed, which is attached directly to the mortar, and which is perfect in its operation, feeding all ores, wet or dry, equally well. It is cheaper than standard stamp mill feeders, and its use is recommended. (See page 7).

AS TO SKILLED MECHANICS

The Tremain Mill is frequently purchased by those who do not feel able to employ experienced mechanics and amalgamators for erecting and operating them. The employment of skilled men is always advisable, at least for a few weeks, and it is believed that it is very often more economical than to undertake the work with men who are inexperienced.

For those, however, who prefer to do the work themselves, directions have been compiled for erecting and operating, which are intended to be explicit and to anticipate as nearly as possible all emergencies that may arise. (See pages 8–18).

SUMMARY

NINETEEN POINTS OF SUPERIORITY POSSESSED BY THE TREMAIN STEAM STAMP MILL

1st. It requires no engine, shafting, pulleys, belting, gears, cams, or tappets in its operation.

2nd. Being operated by direct steam—an extremely elastic fluid—there is less friction and no concussions except between the shoes and dies.

3rd. Not depending upon cams for raising, or gravity in dropping, the speed and capacity per stamp are more than doubled.

4th. It therefore accomplishes as much work as a battery of five ordinary stamps, which costs much more.

5th. One experienced workman per shift can operate the entire plant.

6th. All lubrication is accomplished through one lubricator, using a minimum amount of oil.

7th. It can be erected in less time and for less money than any other mill.

8th. It is entirely self-contained, requiring no frame-work in its erection other than a mortar block.

9th. It has no superior as an amalgamator.

10th. It has a large screening capacity and quicker issue than any other stamp mill.

11th. It produces less slimes than any other mill.

12th. Concentration is easier to accomplish after the Tremain Mill than after any other machine.

13th. It may be operated under a simple shed, in a log building, or entirely independent of any building.

14th. It weighs less than gravity stamps, is easily portable, and can be moved in less time and for less money than any other mill.

15th. The money represented by the abandoned foundations and buildings is but a small fraction of what is left in moving any other stamp mill.

16th. It can be erected and put in operation in a few days, after which a building to suit the climate can be put up without interfering with the operation of the mill.

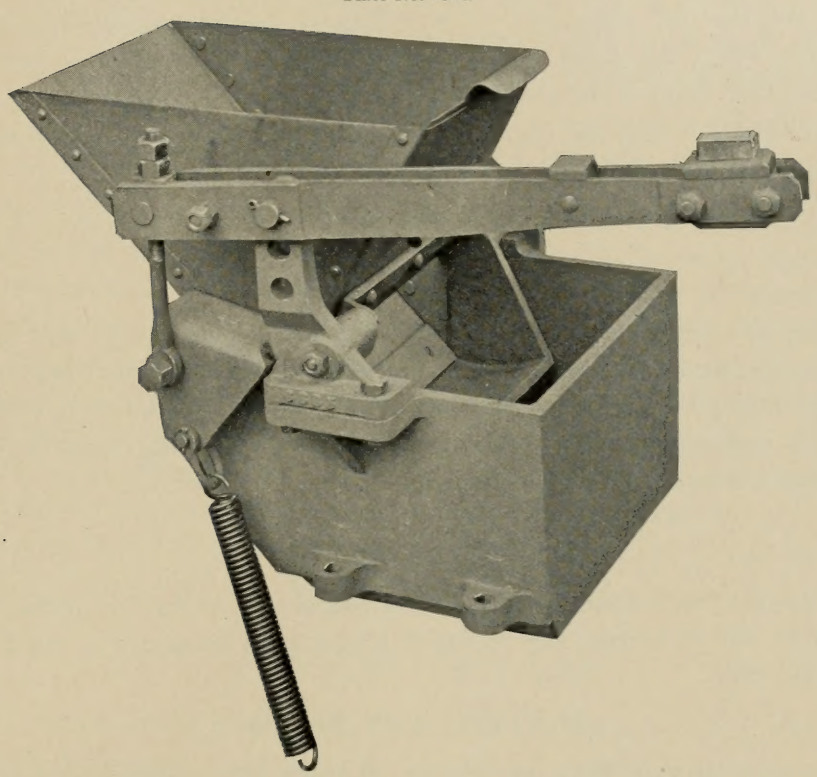
17th. Additional capacity can be quickly and economically added to the milling plant.

18th. It uses the steam expansively and is very economical in the use of fuel.

19th. It is the ideal prospector's mill, and its use will enable the quartz miner to provide a complete milling outfit for development or permanent works at from one-half to one-tenth of the initial expenditure required for any other ore milling plant of equal capacity.

AUTOMATIC FEEDER

Plate No. 292G



The feeder illustrated above has been designed especially for use with the Tremain Mill. It is attached directly to the mortar, and is entirely independent of any other support. In the ordinary types of stamp mill feeders, the hopper is made with perpendicular front, and a large portion of the ore in such hopper is necessarily carried on the part moved to accomplish the feeding. This causes a large amount of friction and requires a heavy blow from the stamp upon the feed levers to move the mechanism.

In this feeder there is not more than a shovelful of ore upon the moving part at any one time. The weight of ore is carried by the hopper, and the moving part handles only that portion that is about to drop into the mortar; as fast as it is fed off, new ore takes its place from the hopper. This feeder is extremely simple in construction and positive in its operation. It is readily adjusted to change feed while running, requires but a light tap from the stamp to operate it, and is, therefore, very sensitive and automatic. It feeds ore wet or dry, and handles sticky or talcose material with a facility equal to that of any feeder in the market. It has fewer parts than other feeders, and is reliable, durable, and inexpensive.

Allis-Chalmers Company recommends its use with the Tremain Mill in every instance.

INSTRUCTIONS FOR ERECTING THE TREMAIN MILL

MILL SITE

Select a mill site convenient to the ore, where the tailings can be disposed of readily, and, if possible, where the water supply can be brought by gravity to a point ten feet or more above the floor level of the proposed mill.

A side-hill location with the above requirements which may be readily reached by an ore road of easy grade is preferably to be chosen.

A plant of this kind may then be proceeded with as follows:

GRADE

Grade into the hill a level floor, 22 feet wide and from 25 to 30 feet back. In the face of this open cut, build a crib of logs or wall of stone to a height that will bring the top of ore floor 6 feet 7 inches above the level of the mill floor. Build the crib about three logs high, then proceed with the erection of the stamp, finishing the crib and ore floor around the feeder after the stamp is in position.

MORTAR BLOCK

For the mortar block secure a section of a sound tree, at least 30 inches in diameter, not less than 12 feet in length, and as much longer as is necessary to reach bedrock or heavy gravel stratum.

SETTING THE BLOCK

Excavate a pit at least four feet square, of the depth required, and if bed-rock is reached before sufficiently deep to accommodate a 12-foot block—28 inches should stand above the surface—it should be blasted out until it will do so. If the bottom of the pit is blasted out of rock it should be deep enough to allow of from four inches to a foot of gravel being tamped in hard on which to rest the end of the block. One-half inch of loose sand on top of the gravel mentioned will accommodate the unevenness of the block and make a fit between it and its gravel support. Make the block perpendicular, secure it in that position, and then tamp it in lightly with gravel or broken stone to within 18 inches of the top of the ground. (Allow the first tailings from the mill to run into and fill the remainder of the excavation).

If unable to reach bed-rock or substantial gravel bed, make the pit deep enough to accommodate a 12-foot block, together with a mud sill, which may be another section of a large tree, six feet long, flattened on its top side for the mortar block to rest upon. This should be carefully bedded in the bottom of the pit upon light gravel or coarse sand. The block may then be put in place, made perpendicular and tamped in as in the former case.

BUILT UP MORTAR BLOCKS

Mortar blocks made of one or two-inch boards securely nailed together are equal to solid blocks in every way, and are sometimes easier to obtain. They should be made of

a section 18 by 36 inches, with boards of the proper length, nailed securely, "breaking joints" with the boards as they are put together, and with care that no nails are driven where they will interfere with the saw in cutting off the top of blocks, or with a bit in boring holes for the lag screws which secure the holding-down bolts to the block. (Drawings are furnished showing the manner of making built-up blocks when they are to be used).

FITTING THE TOP OF BLOCK

The rough top of the block should stand 28 inches above the ground that is to be the floor level of the mill. Measure up 24 inches from the floor and saw the block off at this point, horizontally and with great care, so that its top may be flat and level. If a log block is used, draw a line across the top of the block through its center, parallel with the front of ore bin or square with the building, make parallel marks each side of the line 9 inches distant, cut down on these outside lines 34 inches, and make horizontal cuts to meet the vertical ones; this will leave the block 18 inches thick. Fit centrally an 8 by 10-inch timber, 10 feet long, to each side of the block, let the timbers rest on the shoulders formed by the lower horizontal cuts and bolt them up tight, using 7/8-inch rods on each side. Try the top of the block to see that it is flat and level, and if not, plane it until it is so, then cover with 1/4-inch sheet rubber blanket or belting.

ASSEMBLING THE MILL

Place the mortar on the block centrally, carefully fit the strap bolts (for holding same down) to the block and mortar, as shown in Fig. 290-G, (page 14) fasten with 5/8 by 6-inch lag screws, boring with 7/16-inch bit for same.

Place the four standards or uprights in position and key them fast, driving the keys from the outside. The uprights, keys and slots are numbered to place, and should be properly arranged by such numbers. Place the guide block casting on the two back uprights, setting it down as far as it will go on same; tighten the clamp bolts and set screw. Place the feeder lever stop with hook down upon the back upright on the left side of the machine, as viewed from in front; clamp it fast.

Place the fulcrum blocks upon the two front uprights, with hooks up, and secure them about midway between the thread and shoulder at bottom of uprights. Place one nut on each upright with its flat side down; screw them down to within 6 inches of the end of thread and clamp them.

THE CYLINDERS

These may now be assembled ready to be put in position. The stuffing boxes should be put together, using care to see that the parts are wiped clean. The trunnion blocks may then be secured to the cylinders by means of the 3/4-inch rods which clamp them fast. Set the cylinders in place upon the uprights and put on the remaining four nuts, with flat sides up in this case. The guide blocks may now be secured loosely in their places,

and the tappet collars that are to be placed on the stamp stems set upon the tops of the blocks, with flat sides down. Place the dies in the mortar and the shoes upon the dies, and a piece of 2 by 4 scantling across the shoes. Clean the inside of the cylinders nicely, and blow out any dirt that may be in the steam passages. Clean the stamp stems thoroughly and see that they are smooth all over. If any scratches or nicks have occurred in transit, remove the protruding metal with a fine file.

Having the cylinders, all passages and stamp stems clean and smooth, raise a stamp stem by means of a rope and pulley block, secured in the eye-bolt which screws into the top of the piston, and let it carefully down through the cylinder and guide block, resting it upon blocks laid upon the scantling in the mortar in such a way that the piston will enter the cylinder about half an inch.

PISTON RINGS

Next, the piston rings will have to be placed in position, one set at a time; the rings will be found to be marked in sets, and brass springs will be found in the grooves in the pistons for pressing the rings out to a constant fit in the cylinders. The rings are made in sections, and a rivet will be found projecting out of one piece of each set. Beginning with the lower groove, place the three large pieces first, then follow with the smaller ones, two of which will be found notched in the end to fit around the rivet mentioned above. Having put the members of the set in position loosely, next place the clamp hoop around them and screw the hoop up tight, tapping the outside of the same gently as this is done. Continue until the hoop fits the piston snugly all around, when the rings will be pressed back flush with the piston's diameter, and will now enter the cylinder if the blocks are removed from under the end of stem. If the weight of stem is not sufficient to carry it down, it may be struck on its top with the end of a piece of scantling to gently push the rings through the hoop into the cylinder. The stem is again blocked at a convenient point for inserting the next set of rings, the clamp hoop removed and the process repeated. After all of the rings have been fitted in the piston it may be dropped down below the surface of the top of cylinders, to be out of the way of the operation on the other piston or stem.

VALVE PLATE AND STEAM CHEST

Having placed both of the pistons and all piston rings, dropped both pistons below the surface, and cleaned the flanges on top of the cylinders, the valve plate and the chest may be put in position. Screw the four long stud bolts down hard in their places, being careful not to bend them in the operation. Put the large gasket in position, blackleaded side up, noting that all steam and bolt passages are open. Then set the valve plate in position, being very careful to see that the steam passages will coincide, which they will do if the plate is put with the proper side to the front. Make a gasket of heavy paper to put between the steam chest and the valve plate, and cut it closely around the bolts and steam passages. See that the slide valve and its seat have not been injured in any

way, then place the valve upon its seat, being sure to have it right side around to make the ports fit properly; this will be the case when the single D side of the valve is placed toward the back side of the machine. In other words, the short side of the valve must operate over the three-port side of the valve seat.

Set the chest down over the valve, moving the valve until it slips into place. In bolting the parts together, put the two turned ¾-inch bolts in the middle holes. These bolts are made to fit the holes closely so as to hold the steam chest in its proper position with relation to the plate.

Screw all bolts down tightly by going over them repeatedly with the wrench.

Clamp the tappet collars up evenly on the stems. Then raise the stems, using a lever over the fulcrum pieces on the uprights, and block them up nearly to the top.

If solid shoes are used hang the shims evenly into the holes where the stems will go and let the stems down into them; after the points of stems are entered let them fall, which will wedge them in tight enough, so that when the stems are again raised the shoes will come with them, and each additional drop they are given will further secure them until they are tight. After they have been operated with steam a dozen or more times they will be together as far as they will go, and should be evenly entered in each shoe nearly or quite to the tool mark which will be found on each stem.

The guide block bolts may now be screwed up tight. When the guides are clamped tight the stems should be free to move up and down without pinching.

PISTON ROD PACKING

The packing may now be placed in the glands (see page 17) around the piston rods, which is a matter requiring careful attention. There are many kinds of packing on the market that answer well. Cut pieces long enough so that the ends will butt together when crowded into place; three rings of either will fill the gland when newly packed.

PUTTING THE FEEDER IN PLACE

The automatic feeder may now be assembled and put in place, using rubber packing between it and the mortar. Four-ply rubber belting split in the middle makes good packing for this joint. The packing should be applied between the feeder and the mortar on the angle surfaces, so that when the feeder is drawn down by the bolts it will pinch and hold the packing all around. Secure the lever at the top hole of the fulcrum piece, when the shoes and dies are new; adjust the spring so that it will pull the lever up against the tappet collar or stop.

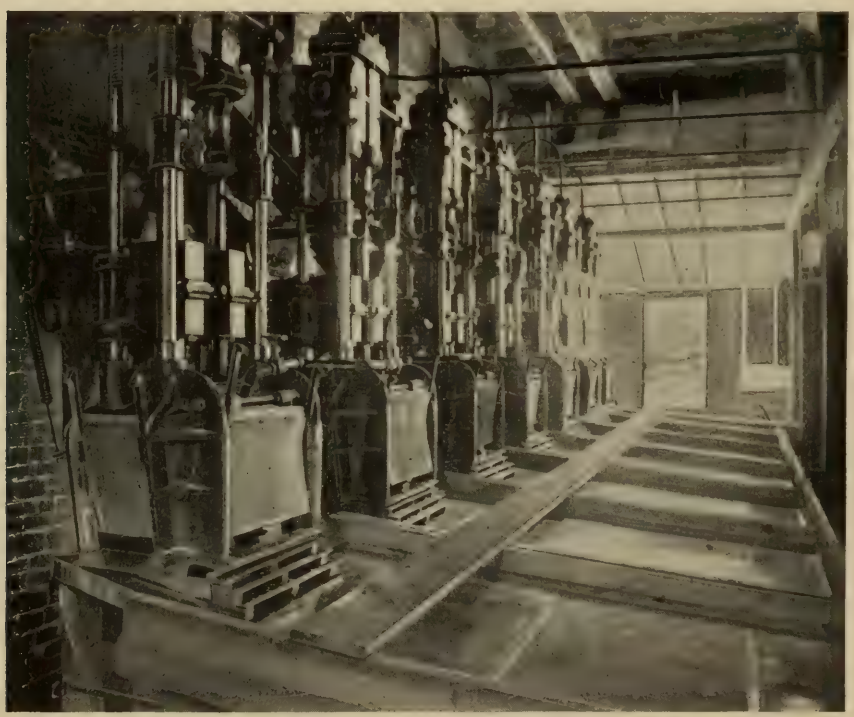
BOILER AND PIPING

Place the boiler in position and make it level and square with the situation of the mill. Raise the smoke stack, put the grates in place, connect the injector as per printed instructions sent with it; connect the steam and water gauges. Pack the hand hole plates

and screw them up tight, put the blow-off cock and safety valve in place. Connect to the stamp, putting a globe valve in the pipe near the steam dome; screw a short piece of pipe into the valve, then a tee that will accommodate the lubricator, thence to the stamp, using 1¼-inch fittings as far as the lubricator, and 1-inch pipe from there to the stamp. Use a nipple 3 inches long on top of steam chest, put an elbow on this, then a piece of pipe 12 inches long. Stand this straight in front, put an elbow on it, then an 8-inch nipple, with a union; bring the line of pipe from the lubricator directly toward the smoke stack, thence up to within three inches of level with the pipe coming from the stamp; thence toward the stamp to connect the same. Place a globe valve in the pipe close to the union, but between same and the boiler. See that all pipe and fittings are free from dirt on the inside before screwing them together. Support the pipe near the union, and near the smoke stack. Screw a 1¼-inch by 4-inch nipple into the exhaust opening, put an elbow on this, and run the pipe direct to the smoke stack and into the same about 3 inches lower than level with the exhaust opening in the cylinder. Use a union close to the smoke stack and turn the end of pipe up with a nipple about 6 inches long.

The crib work or wall may now be finished and the sleepers arranged to carry the ore floor. There should be a liberal number of these.

Plate No. 460G



INSTALLATION OF EIGHT TREMAIN MILLS

ORE FLOOR

Make the floor of 2-inch plank, at such a height that the top of the boards will be flush with the top of feeder hopper. Lay the first board so that it will extend out 6 inches on each side of the hopper, and cut it closely around same. Lay the boards tightly together and raise ends and front 3 feet high. Cut a semi-circular hole in the front over the hole in floor, so that when broken ore is piled against the wall of plank it will run into the feeder easily.

APRON PLATES

The apron plate should be placed upon a substantial frame work, with foundation independent of the mortar block. It must be level crosswise, and usually has a slope of 1½ inches to the foot in length.

WATER SUPPLY

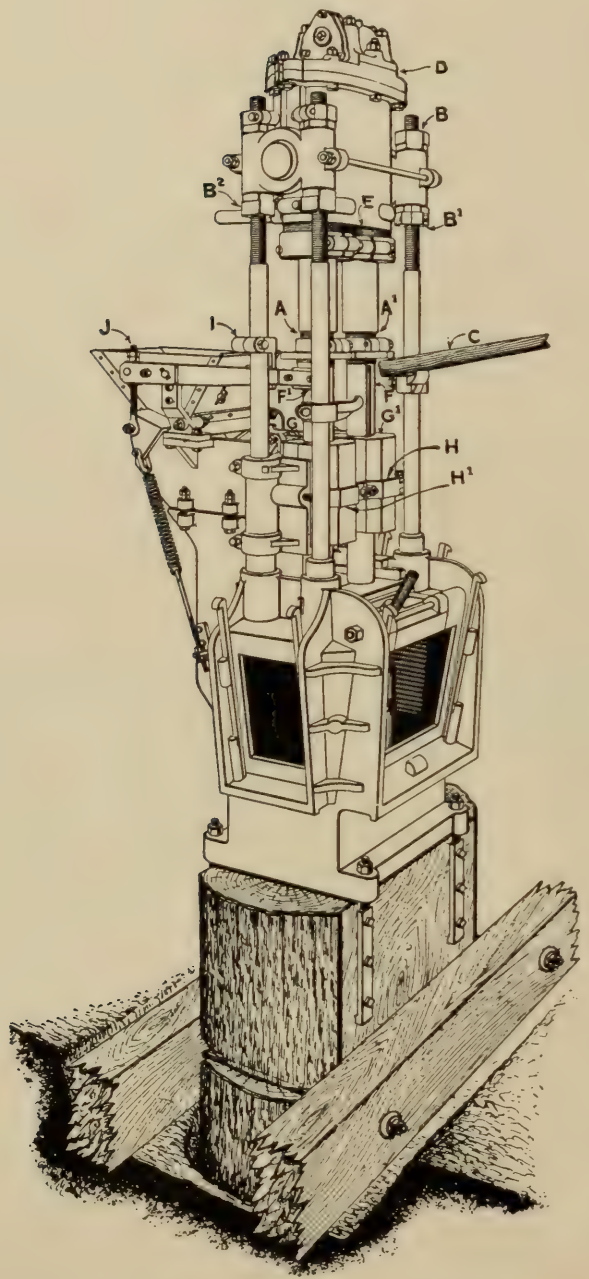
Place a barrel upon the ore floor or other convenient place above the level of the top of feeder; connect 1¼-inch pipe to the side of same about 3 inches above the bottom; run this line of pipe over to the mortar. Place a tee in the pipe convenient for connecting to the injector supply pipe, carry the pipe along the side of stamp nearest to the boiler, drop a ¾-inch nipple from the underside of the pipe near the mortar, then reduce to 1 inch finally at the end in a place convenient for connecting the 1-inch water hose, which is to be fastened to the nozzle on front of mortar. There should be a valve in the supply pipe to stamp near supply hose. The nipple that is dropped should be provided with a valve and about 10 feet of ¾-inch rubber hose for washing down plates. If the water is brought to the mill in a ditch or flume, the top of the barrel should have a screen upon it to prevent chips and leaves from getting into the pipes. An overflow should be provided for the barrel and the excess of water carried into the tailings spout.

TOOLS AND EXTRAS

Included with each Tremain Mill are the following tools and extras:

1 Full Set of Wrenches.
1 Drop Gauge.
1 Drift and Gib for removing boss-heads and shoes.
1 Set Anchor Bolts with lag screws.
1 Rubber Sheet for top of mortar block.
1 ½ Pint Lubricator with fittings and connections to steam pipe.
1 Spring Joint for steam pipe.
1 Set of Water Pipes with fittings for mortar.
10 Feet ¾ Hose with Couplings.

Plate No. 290G



TREMAIN STEAM STAMP

NEW VALVE MECHANISM

The valve mechanism which Allis-Chalmers Company brought out and adopted during the latter part of 1897 has proved an entire success. It differs from the form previously in use in that all mechanism is enclosed within the steam space. It is entirely steam actuated and steam cushioned, and moves with precision within its prescribed limits, automatically. There are no stuffing boxes, stems, buffers, nuts or adjustments connected with it.

If by any chance it becomes centered—which may occur in starting with the parts cold—it is only necessary to place the starting rod in the valve chest cover against the end of piston and push it to the opposite end of chamber; admit steam gradually until one of the stamp stems raises; if the valve does not move when the stamp has reached a high position, quickly close the throttle valve and allow the stamp to fall–then try again. A little practice will make the operator acquainted with the machine and enable him to start in every case without trouble.

KEEPING EVEN STROKE OF STEMS

When the shoes are down upon the dies with no rock or sand between them the ends of piston rods proper AA^1 will be found to be at a common level if the shoes and dies are new and the stems equally entered. If at any time during the operation of the machine one of these piston rods AA^1 is found to continually stop at a point higher than its mate, the operation of the machine will be affected and may be uneven or jerky; the cause is either uneven entering of the stems in the shoes or uneven wearing of the shoes and dies. The remedy is to use the longer shoe with the shorter die, or shorter shoe with longer die, or to shim the stems to even matters up in the mortar, so that the points AA^1 will again find a common level at each drop.

The above is given for use in an emergency that seems possible. A case of uneven wear of shoes and dies has not come under observation. It cannot occur except from an unequal hardness or difference in texture of the wearing parts themselves.

(Letters of reference in this description refer to plate 290G, page 14).

The normal drop of the stamp is 6 inches, and need never exceed this amount. As the shoes and dies wear, the cylinders are lowered by means of the clamp nuts B^1, B^2, to compensate for same. If the drop is allowed to get too long the pistons may strike the top of the cylinders on the up stroke, making a noise that will be readily understood and which indicates that the cylinders must be lowered at once.

DROP GAUGE FURNISHED WITH EVERY MACHINE

A drop gauge is furnished with every machine to be used in setting the cylinders for getting the proper drop in starting a new mill.

To use the gauge, place the end opposite the handle upon the square end of cylinders between the stuffing box nuts, and hold the right-angled projection under the tappet collars;

alternating from one to the other, observe carefully to make sure that both stems are coming down to the same relative position on the gauge. If there appears to be a difference in this respect it should be remedied by manipulating shoes and dies as mentioned above. When the tappet collars come low enough to strike the gauge the cylinders should be lowered about two turns of the post nuts at a "setting".

When the machine is in continuous operation the cylinders are lowered a small amount every day and the operator soon learns the length of drop that gives the best satisfaction in the case in hand, and will be able to keep the cylinders properly set without a gauge of any kind.

The stems FF^1 should be tried with the lever C after each cylinder setting operation, to see that they are not bound or pinched by uneven setting of the nuts B^1, B^2.

GUIDE BLOCKS

As the guide blocks GG^1 wear, they should be refitted. There should never be more than one-sixteenth of an inch play all around the stem. The front block will ordinarily wear the faster. Shims may be placed behind the back block to bring it forward as it wears.

SECURING THE FEEDER TO THE MORTAR

In securing the Automatic Feeder to the mortar, the gasket should be fitted to the beveled surfaces. The adjusting screw on the lever stop I may be manipulated to give any amount of feed desired. The nuts on the eye-bolt J, connecting the lever with the swing plate below the hopper, can be adjusted to assist or retard the flow of ore at will; dry granular material will have to be retarded, while wet, sticky ores will be assisted to run by this means.

Very wet ore is handled in this feeder with as much satisfaction as very dry ore, and in cases where sticky material is being handled the introduction of a small stream of water directly into the feed hopper is advised. Unlike many other feeders, this machine will not become "sloppy" by the addition of water to prevent "gumming up".

STARTING

When the machine is in proper running order, heated alike throughout the cylinders, ready to start, the steam should be shut off, and the stems tried with the lever; they should be very free in their up and down movement over the whole length of stroke. See that the nuts on uprights do not pinch the trunnion block too tightly, making the stems tend to stick at top of cylinder.

Supply the feeder with ore; turn the water into the mortar, open the cylinder cocks and start the lubricator to working. Open the throttle slightly, then close the cylinder cocks, opening the throttle, when the machine will start. If at first the valve stops on the center, shut off the steam, then move with the rod and try again. New machines require a day or two in operation to get thoroughly limbered up.

Allow the lubricator to feed quite fast until the oil shows upon the piston rods of the stamps, then regulate to give a slower but regular feed, which will be all that is required.

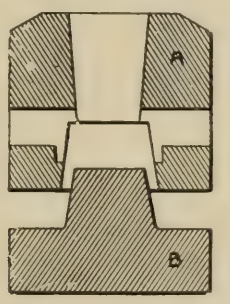
PACKING PISTON RODS

In cases where "made to fit" packings are not readily obtainable, the following is the procedure recommended: Insert a strip of 1/8-inch or 3/16-inch sheet rubber packing, about 2 1/8 inches wide, or a little less than the depth of the box, and of a length equal to the circumference of the gland; butt the ends and crowd into the box, then fill the place between rubber and stem with braided hemp or flax packing slightly moist. Do not put oil on hemp packing for hot rods, as the oil causes the packing to burn out quickly. The hemp or flax will be quickly saturated with water after the steam has been turned on, and this is the condition desired. The rods will get sufficient lubrication from the cylinder. Do not attempt to make the piston rod packing tight to start with; leave the glands loose enough so that the steam will blow through until everything is hot and equally expanded about the cylinders. After the machine is running evenly, the stuffing boxes may be taken up until the leak of steam or water is stopped, but do not try to keep the glands too tight, as the stamps are very sensitive on the up stroke, owing to the small area on the underside of the pistons. Always tighten the stuffing boxes with the machine in motion, and screw up the clamp bolts snugly to keep them in position.

SECTIONAL SHOE

Allis-Chalmers Company makes sectional shoes for the Tremain Mill as illustrated herewith. The boss-head A in combination with the shoe B makes up a complete shoe of the same length as the pattern formerly in use. It also makes a false bottom to go into the mortar for raising the partly worn dies and permitting the use of them until entirely worn out without very materially altering the point of discharge of the mill. The use of these is recommended.

Plate No. 616G



The advantages claimed for these improvements are: 1st—This form of shoe is capable of being worn nearly all away and the amount of metal going to the scrap heap is reduced to a minimum. The shoes being short, the weights of moving parts are much more uniformly maintained than with the long shoe, and the wearing faces are not so

liable to become out of true as with longer castings. It becomes easier to maintain an even height of drop with this arrangement, owing to the ease in making changes to meet the circumstances.

By using the false bottom for mortar the dies may be worn down one-half, then raised upon the false bottom and finished upon same, thus insuring a maximum capacity with an economical use of the wearing parts. The boss-heads are made of cast steel and the false bottom for mortar is made of cast iron. Shoes and dies are best when made of steel.

Hardwood wedges 3 inches long, 7/16 inch thick and about ½ inch wide, whittled to a short blunt point, are best for use in securing the shoe into the boss-heads; they are set around the neck of the shoe, point up and tied with a piece of cord or secured with a rubber band. A supply of these should be kept on hand.

PUTTING ON SHOES

In placing shoes on the stems care should be exercised to have the stems entered evenly. A tool mark is put upon each stem which is intended to go down nearly or quite to the shoe; these tool marks readily show any difference that there may be. Use shims of the same thickness unless it is seen that the stems do not enter evenly, in which case thinner shims should be used for the high stem, or thicker ones for the low stem, or both, to bring them to a common level.

WEARING SHOES AND DIES EVENLY

The stems are free to turn either or both ways, and are found to revolve and work in all portions of the revolution. They are provided with three slots or key seats each, and with wooden keys to run in same. If it is seen that a stem persists in staying in one position, coming back to the same place quickly when turned out of it, the key may be placed in the slot that will hold the stem in the position opposite to the one that it persists in coming to, and be held there until the difficulty is remedied, and the stem be disposed to again occupy any position. This makes an admirable means of regulating the wear of shoes and dies.

See that the stream of water entering the mortar does not pour upon either die; if it does it will wash off the ore at each stroke and make the stamp pound iron on that side.

PAPER GASKET

A paper gasket should always be used for packing the joints between the steam chest and valve plate at D. Paper will not be compressed unevenly.

IF TROUBLE OCCURS

If trouble of any kind occurs with the machine do not attack it with hammer and wrench until you have devoted a little time to reasoning with yourself about it, bearing in mind that extreme methods may possibly lead to breakages that may be expensive. If a remedy is not found, write to Allis-Chalmers Company, taking as much pains to explain in detail what appears to be the trouble as the Company has taken in trying to anticipate any emergencies that may arise.

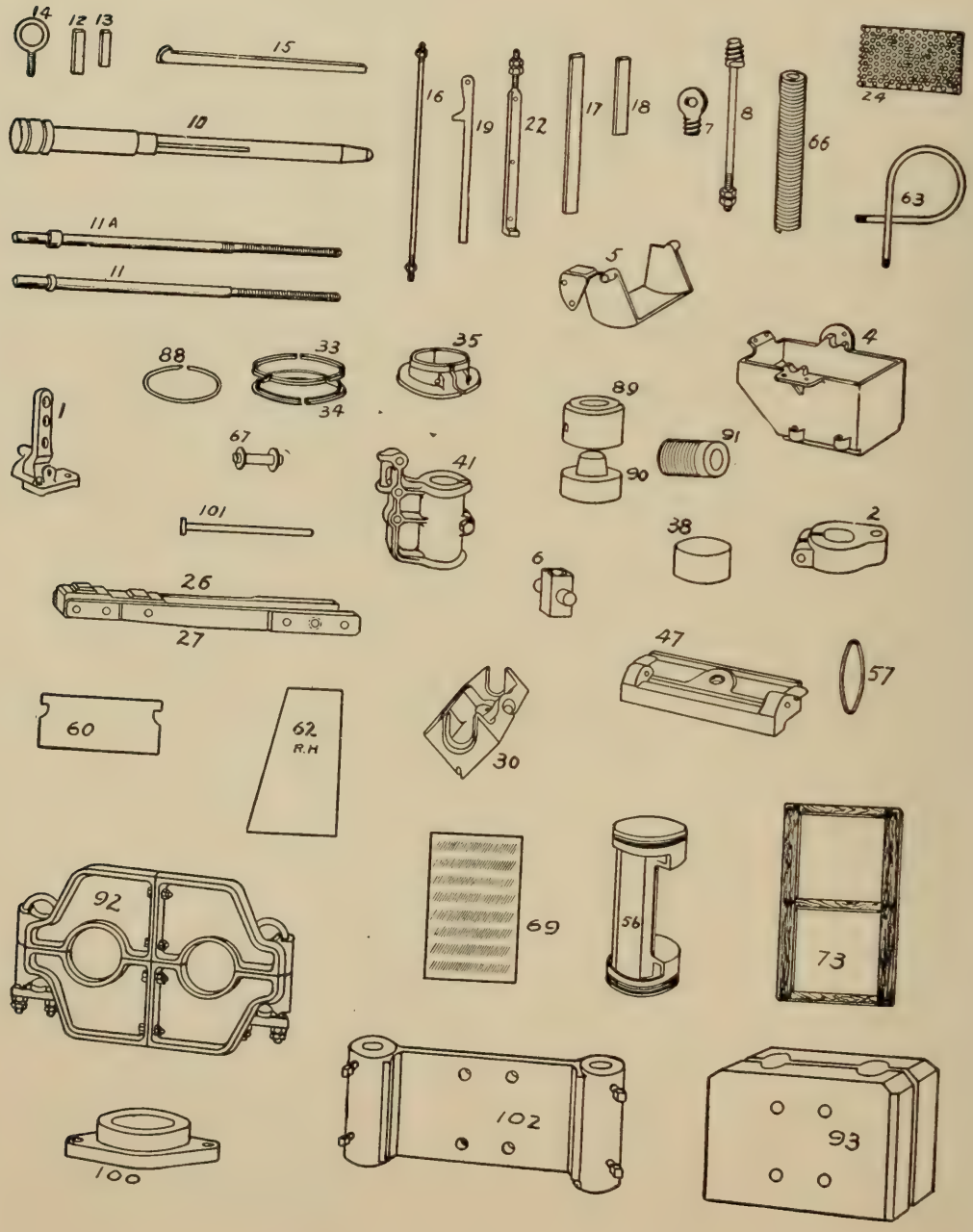
TREMAIN STEAM STAMP MILL

List of repair parts for all machines purchased subsequent to March 25, 1907.

Part No.	Name of Part.
1	1–Feeder Lever Fulcrum
2	1–Feeder Lever Stop
4	1–Feeder Frame
5	1–Feeder Swing
6	1–Feeder Lever Separator
7	1–Screw Eye for Feeder Spring
8	1–Screw End for Feeder Spring
9	1–Slide Door for Feeder Hopper
10	1–Stamp Stem
11	1–Front Upright
	1–Back Upright with Lock Nuts
12	1–Long Key for Upright
13	1–Short Key for Upright
14	1–Eye Bolt for Raising Stems
15	1–Screen Frame Key
16	1–Binder Rod
17	1–Front Screen Apron Support Bar
18	1–Side Screen Apron Support Bar
19	1–Drop Gauge
22	1–Anchor Bolt
23	1–R. H. Pan for Side Discharge
24	1–Guard for Copper Plate for Back of Mortar
25	1–L. H. Pan for Side Discharge
26-27	1–Feeder Lever
28	1–Cylinder
29	1–Valve Plate
30	1–Slide Valve
33	1–Square Ring in 3 Pieces—Brass Dunbar Piston Packing
34	1–L Ring in 3 Pieces—Brass Dunbar Piston Packing
35	1–Tappet Collar
36	1–Cylinder Trunnion Block
38	1–Die
41	1–Fulcrum Collar
48	1–Solid Mortar
	1–Sectional Mortar (47-49 to 54-94-95)
54	1–Steam Chest
55	1–Steam Chest Cover
56	1–Piston Valve
57	1–Piston Valve Ring
58	1–Piece Silver Plated Copper for Back of Mortar
59	1–Piece of Silver Plated Copper for Front of Mortar
60	1–Piece of Silver Plated Copper for Side of Mortar
62	1–Piece of Silver Plated Copper for Pans
63	1–Loop for 1-inch Pipe
64	1–Rubber Gasket for between Valve Plate and Cylinder
66	1–Spring for Feeder Swing
67	1–Feeder Lever Fulcrum Pin
68	1–Front Battery Screen
	30 Mesh Punched Steel
	30 Mesh No. 27 Brass Wire
	35 Mesh No. 29 Brass Wire
	40 Mesh No. 30 Brass Wire
69	1–Side Battery Screen
	30 Mesh Punched Steel
	30 Mesh No. 27 Brass Wire
	35 Mesh No. 29 Brass Wire
	40 Mesh No. 30 Brass Wire
73	1–Front Screen Frame
74	1–Side Screen Frame
75	1–Cylinder Drain Cock and Pipe
76	1–Air Cock for Steam Chest
77	1–¾ x 7⅜ Stud for Steam Chest
78	1–¾ x 6¼ Bolt for Steam Chest
79	1–Bracket for Spring
80	1–Eye Bolt for Feed Swing
81	1–"S" Hook for Spring
83	1–Split Nut for Uprights
87	1–Feeder Hopper
88	1–Spring for Dunbar Piston Rings
89	1–Boss Head—Cast Steel
90	1–Shoe for Boss Head
91	1–Gland for Starting Rod
92	1–Drip Pan (in 4 pieces)
93	1–Guide Block (in 2 pieces)
96	1–Distance Piece for Upright
97	1–Rubber Mortar Cover for Solid Mortar
98	1–Steel Mortar Cover for Solid Mortar (in 2 pieces)
99	1–False Bottom—Hard Gray Iron
	1–False Bottom—Cast Steel
100	1–Main Piston Gland
101	1–Starting Rod
102	1–Guide Block Bracket
	1–Drift for Boss Head
	1–Gib for Boss Head
	1–Collar Bolt for Guide
	1–Set of Water Pipes
	1–Rubber Sheet for Under Mortar
	1–Rubber Apron for Front Screen
	1–Rubber Apron for Side Screen
	1–Forged Wrench for Upright Nuts
	1–½-pt. Lubricator and Fittings
	1–Lb. Garlock Packing
	1–Lb. Goodsells Packing
	Copper Table
	Electroplating Copper Plates with ounce of Silver per square foot
	Flanged Copper Plate for use when Mill has no Side Pans

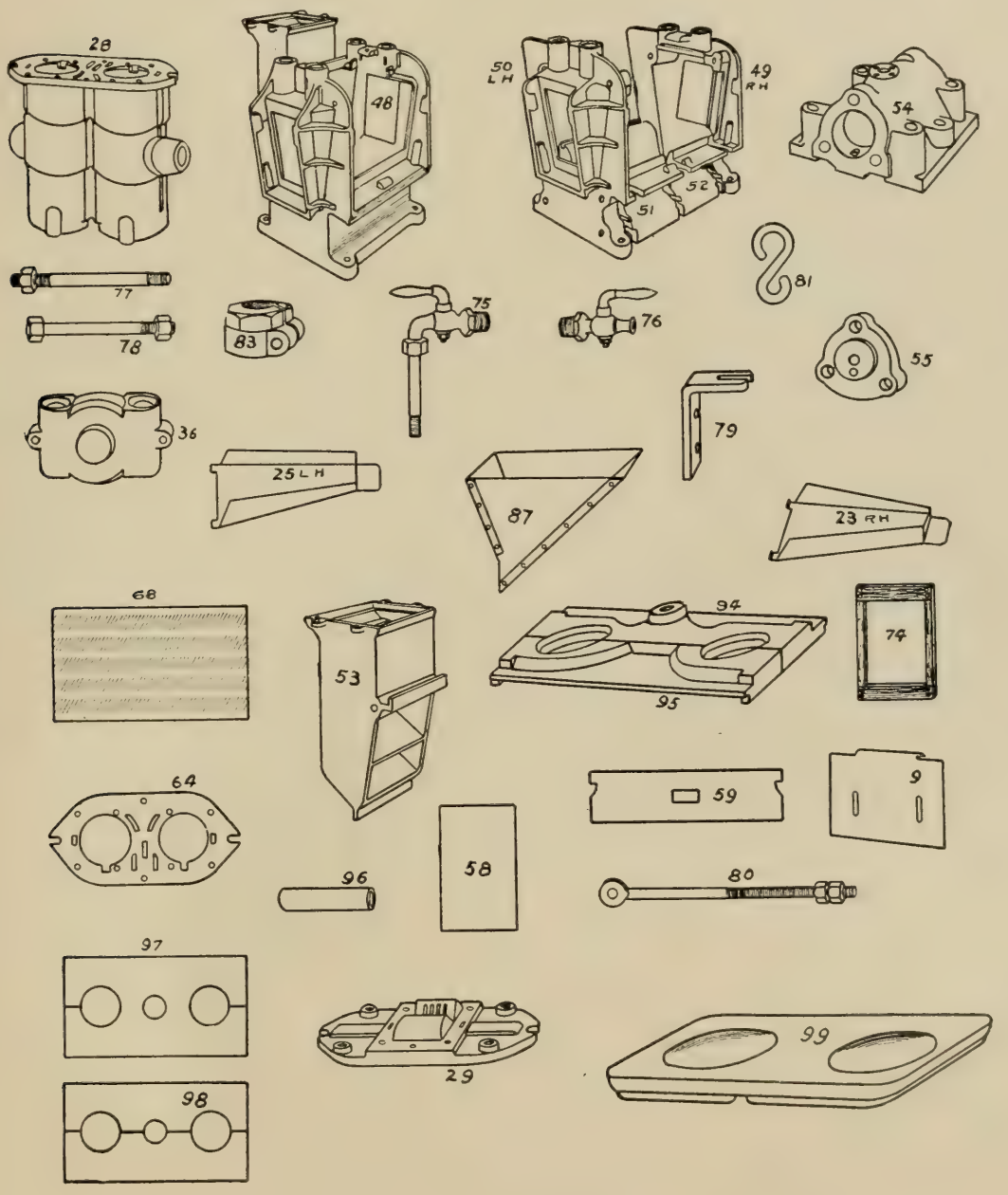
TREMAIN STEAM STAMP MILL

List of repair parts for all machines purchased subsequent to March 25, 1907.



TREMAIN STEAM STAMP MILL

List of repair parts for all machines purchased subsequent to March 25, 1907.



THE NAME OF EACH PART DESIGNATED BY A NUMBER, IN PLATES ON PAGES 23 AND 24 WILL BE FOUND IN THE FOLLOWING LIST

These parts are for machines purchased previous to March 25, 1907. For later design see pages 19, 20 and 21.

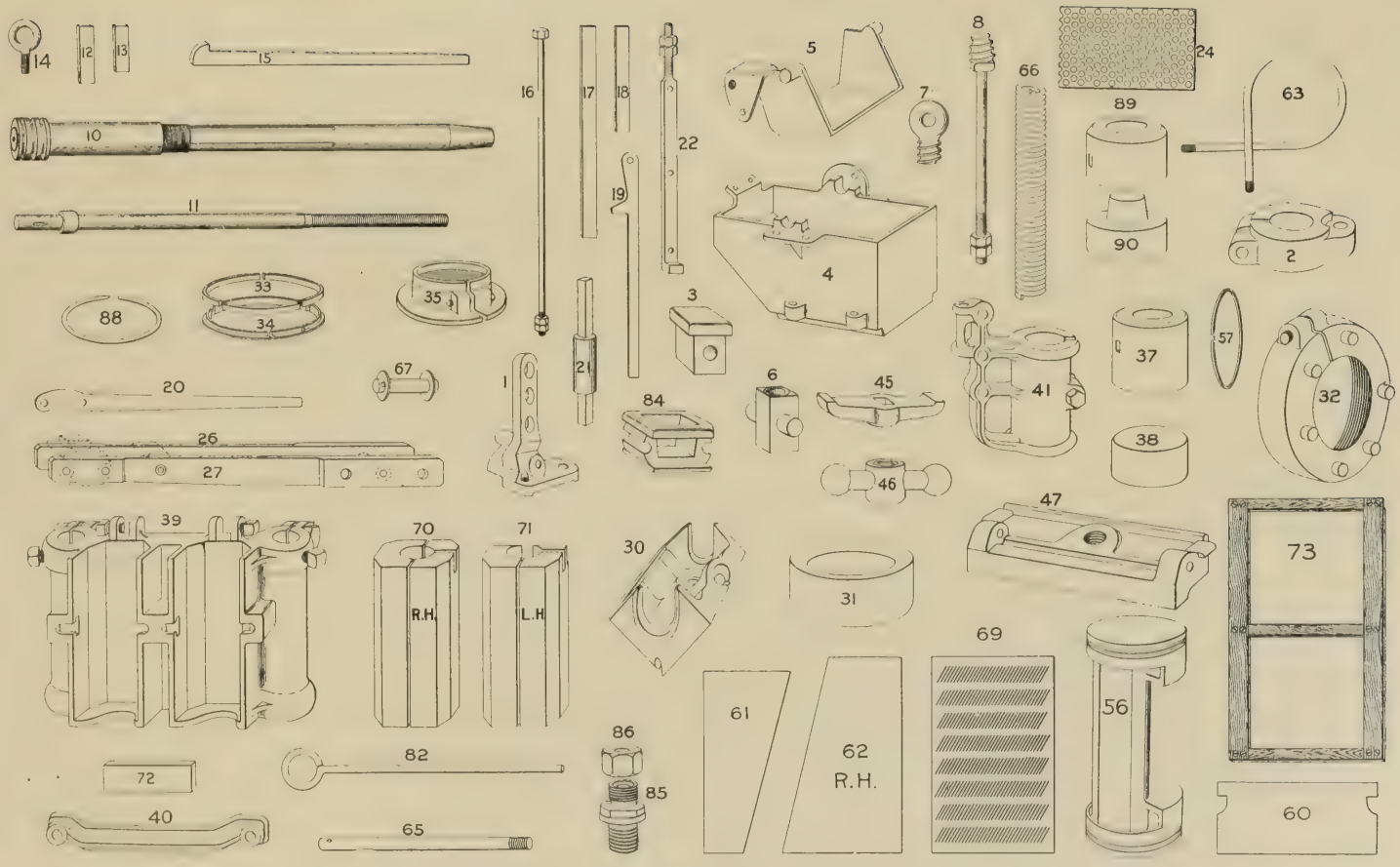
Name of Piece.

Fig. 1 Feed Lever Fulcrum.
2 Feed Lever Stop.
3 Feed Lever Gauge Block.
4 Feeder Frame.
5 Feeder Swing.
6 Feeder Lever Separator.
7 Screw Eye for Feeder Spring.
8 Screw End for Feeder Spring.
9 Slide Door for Feeder Hopper.
10 Stamp Stem.
11 Upright.
12 Key for Upright (long).
13 Key for Upright (short).
14 Eye Bolt for raising stems.
15 Screen Frame Key.
16 Binder Rod.
17 Front Screen Apron Supporting Bar.
18 Side Screen Apron Supporting Bar.
19 Drop Gauge.
20 Spanner Wrench for Split Nuts on cylinders.
21 Pin for hand hole plate cover.
22 Anchor Bolt.
23 R. H. Pan for side discharge.
24 Guard for Copper Plate for back of Mortar.
25 L. H. Pan for side discharge.
26 Feeder Lever L. H. Strap.
27 Feeder Lever R. H. Strap.
28 Cylinder.

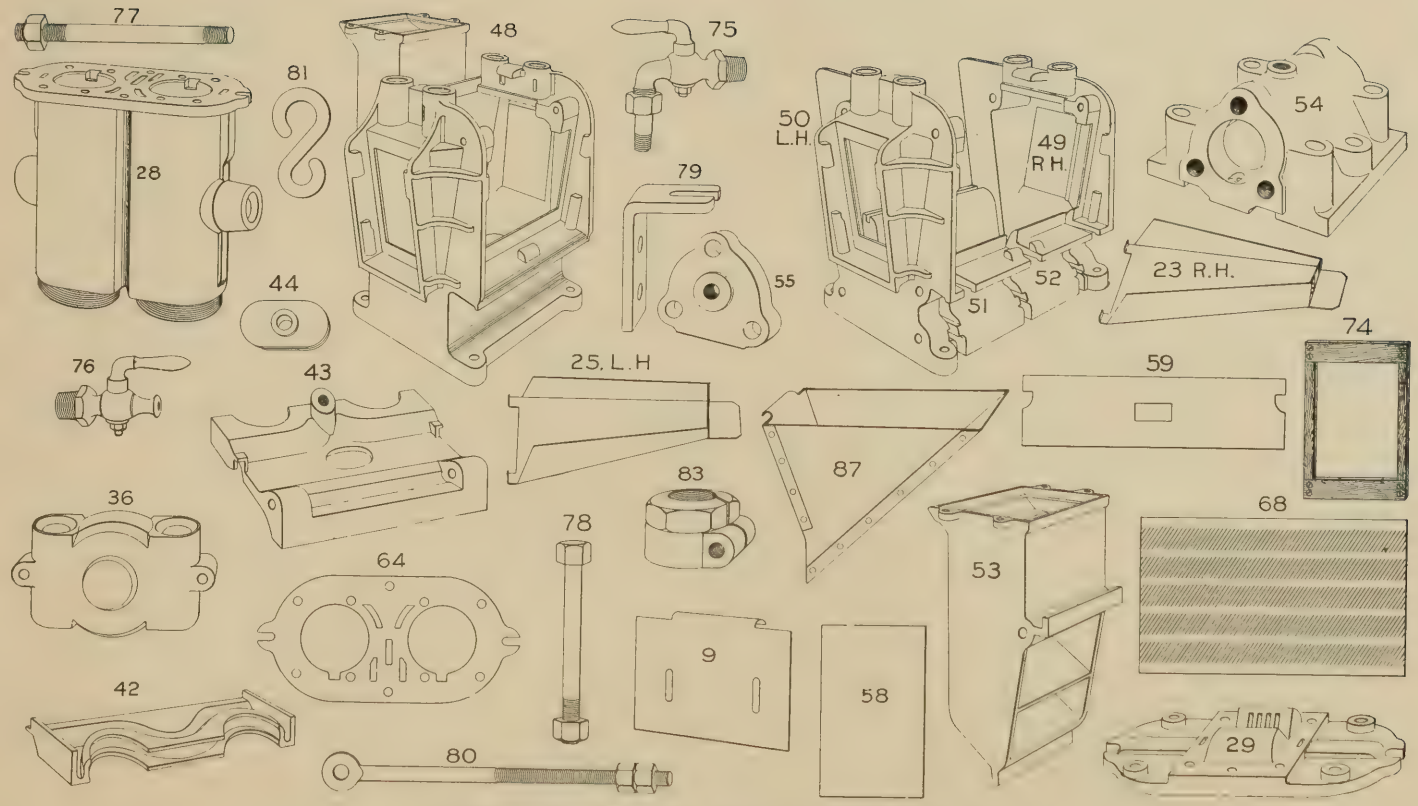
Name of Piece.

29 Valve Plate.
30 Slide Valve.
31 Main Piston Gland.
32 Split Nut for screwing up glands.
33 Three piece □ ring } Dunbar Piston Packing
34 Three piece ⌊ ring } Dunbar Piston Packing
35 Tappet Collar.
36 Cylinder Trunnion Block.
37 Shoe (solid).
38 Die.
39 Guide Block Bracket.
40 Guide Block Clamp.
41 Fulcrum Collar.
42 Mortar Cover (small piece).
43 Mortar Cover (large piece).
44 Mortar Cover hd. hole cover.
45 Mortar Cover crab claw.
46 Motar Cover handle.
47 Cross Bar for Mortar.
48 Solid Mortar.
49 R. H. end for Sectional Mortar.
50 L. H. end for Sectional Mortar.
51 L. H. center section for Sectional Mortar.
52 R. H. center section for Sectional Mortar.
53 Rear Section for Sectional Mortar.
54 Steam Chest.
55 Steam Chest Cover.
56 Piston Valve.

Continued on Page 25.



TREMAIN STAMP MILL DETAILS



TREMAIN STAMP MILL DETAILS (2)

Name of Piece.

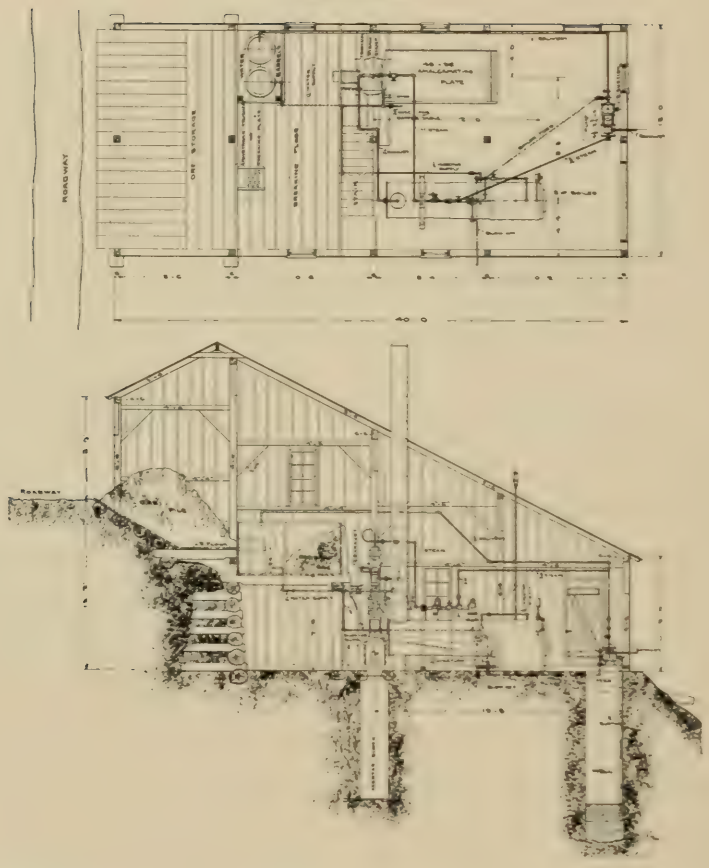
Fig. 57 Piston Valve Ring.
58 Piece of silver plated copper for back of Mortar.
59 Piece of silver plated copper for front of Mortar.
60 Piece of silver plated copper for sides of Mortar.
61 Piece of silver plated copper for corners of Mortars.
62 Piece of silver plated copper for pans.
63 Loop for 1-inch pipe.
64 Rubber gasket between valve plate and cylinder.
65 Indicator Card Stem.
66 Spring for Feeder Swing.
67 Feeder Lever Fulcrum Pin.
68 Front Battery Screen.
69 Side Battery Screen.
70 Pair R. H. Guide Blocks.
71 Pair L. H. Guide Blocks.

Name of Piece.

72 Key for Stamp Stem.
73 Front Screen Frame.
74 Side Screen Frame.
75 Cylinder Cock.
76 Air Cock for Steam Chest.
77 ¾″x7⅜″ Stud for Steam Chest.
78 ¾″x6¼″ Turned Bolt for Steam Chest.
79 Bracket for Spring.
80 Eye Bolt for Feed Swing.
81 S Hook for Spring.
82 Starting Rod.
83 Split Nut for Uprights.
84 Bumper Castings for Feed Lever.
85 Stuffing Box for Indicator Card Stem.
86 Gland for Indicator Card Stem.
87 Feeder Hopper.
88 Spring for Dunbar Piston Rings.
89 Boss Head.
90 Shoe for Boss Head.

On the following pages are given Standard Specifications for different arrangements of Tremain Stamp Mills.

Plate No. 463G



TREMAIN MILL WITHOUT ENGINE OR CRUSHER

PLATE NO. 463 G.

1 Tremain Steam Stamp Mill, with Feeder.

1 Copper Plate, 48x114x⅛ inch Silver-Plated 1 oz. silver per square foot, mounted upon table, with mercury trap attached.

1 Set of Mortar Lip Plates, ⅛ inch thick, silver plated with 1 oz. silver per square foot.

1 No. 5½ Pot Retort, 4½x5½x7 inches deep, with Cover, Wedge and Condensing Pipe.

1 15 H. P. Locomotive Boiler on Skids.

1 Injector.

1 Boiler Feed Pump.

1 "Armstrong" Crushing Plate.

All Pipe and Fittings for Steam and Water Supply for Boiler, Injector, Pump and Stamp.

2 Extra Boss Heads, cast iron.

4 Extra Shoes, forged steel.

4 Extra Dies, white iron.

1 False Bottom for Tremain Mill.

6 Extra Sets Screens.

1 Extra Set Screen Frames.

10 Lbs. Imperial Packing.

1 Sq. Yard Rainbow Packing.

TREMAIN MILL WITH ENGINE AND CRUSHER

1 Tremain Steam Stamp Mill, with Feeder.
1 Copper Plate, 48x114x⅛ inches, Silver-Plated, 1 oz. per square foot, mounted upon table, with mercury trap attached.
1 Set Mortar Lip Plates, ⅛ inch thick, Silver-Plated, 1 oz. per square foot.
1 No. 5½ Pot Retort, 4½x5½x7 deep, with Cover, Wedge and Condensing Pipe.
1 20 H. P. Locomotive Boiler, on Skids.
1 7 H. P. Vertical Engine with Foundation Bolts and Governor Belt.
1 Injector.
1 Boiler Feed Pump.
1 Set of Building Bolts.
All Pipe and Fittings for Steam and Water Supply for Boiler, Injector, Pump, Engine and Stamp.
1 7x9 Dodge Crusher.
50 Feet of 4-inch 4-ply Rubber Belt for Crusher.
2 Extra Boss Heads, cast steel.
4 Extra Shoes, forged steel.
4 Extra Dies forged steel.
1 False Bottom for Mortar.
6 Extra Sets Screens.
1 Extra Set Screen Frames.
10 Lbs. Imperial Packing.
1 Sq. Yard Rainbow Packing.

SECTIONAL TREMAIN MILL WITH SECTIONAL CRUSHER [BOILER AND ENGINE KNOCKED DOWN AND CRATED FOR MULE-BACK TRANSPORTATION

1 7x9-inch Dodge Crusher, sectional.
1 Sectional Tremain Mill, with Feeder.
1 Silver-Plated Copper Amalgamating Table, 48x114x⅛, Copper Mounted, Sectionalized.
1 Set Mortar Lip Plates, Silver-Plated, 1 oz. per square foot.
1 No. 5½ Pot Retort, 4½x5½x7 inches deep, with Clamp, Wedge and Condensing Pipe.
1 20 H. P. 36x10 inches, Sectional Tubular Boiler, with half front fixtures, knocked down and nested.
1 7 H. P. Vertical Engine, Sectional.
1 Injector.
1 Boiler Feed Pump.
All Pipe and Fittings for Steam and Water Supply for Boiler, Injector, Pump, Engine and Stamp.
50 Feet of 4-inch, 4-ply Rubber Belt to drive Crusher.
1 Set of Riveting Tools, with Small Buffalo Forge.
1 Set of Building Bolts.

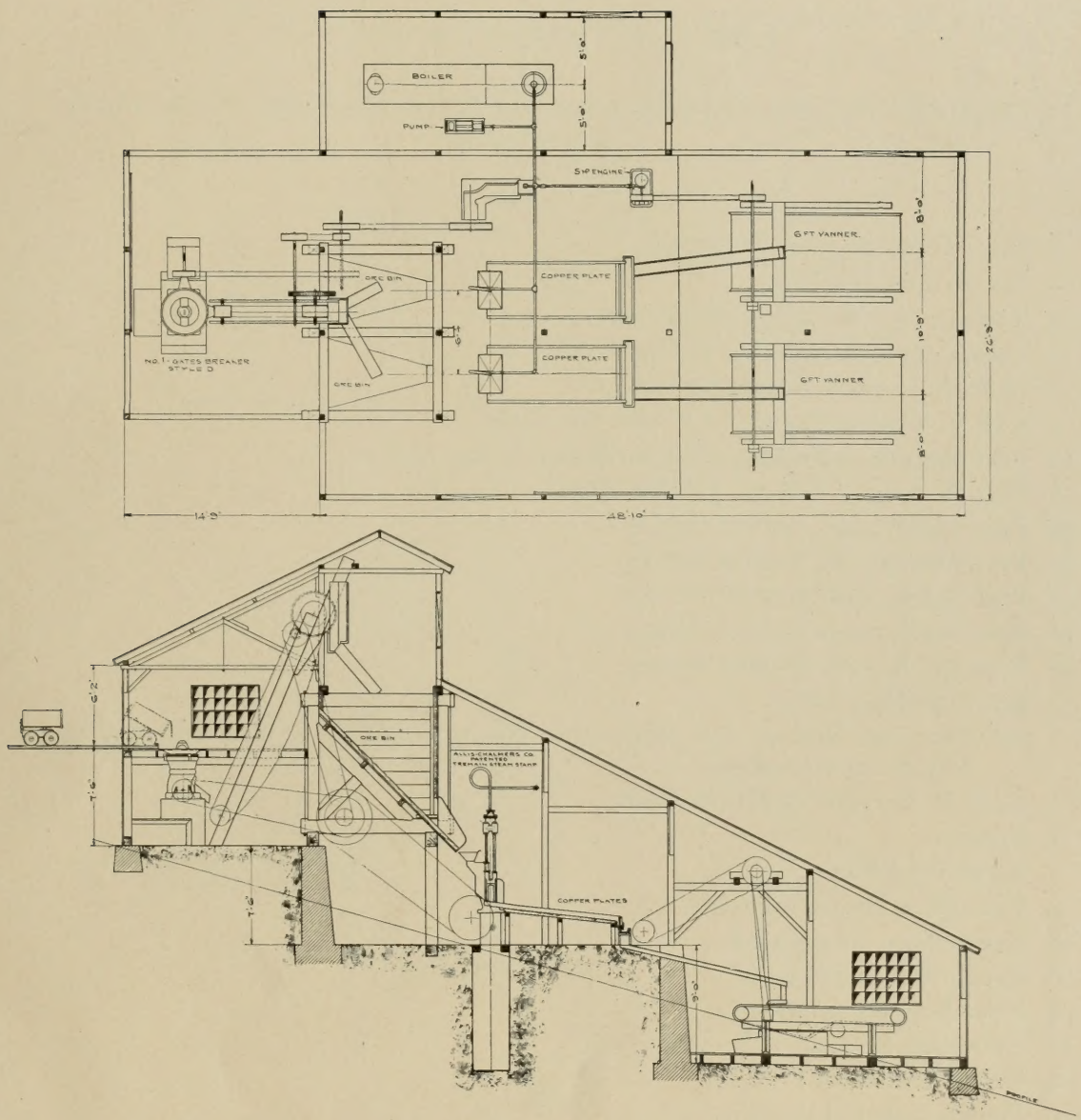
2 Extra Boss Heads, cast iron.
4 Extra Shoes, forged steel.
4 Extra Dies, forged steel.
1 False Bottom for Mortar.
6 Extra Sets Screens.
1 Extra Set Screen Frames.
10 Lbs. Imperial Packing.
1 Sq. Yard Rainbow Packing.

TWO TREMAIN MILLS WITH CRUSHER, PLATES AND VANNERS

PLATE 4318

1 No. 1 Gates Breaker, Style "D".
1 No. 2 Gates Elevator.
2 Tremain Steam Stamp Mills, with Feeders.
2 Sets Mortar Lip Plates, Plated 1 oz. Silver, per square foot.
2 Copper Plates, 48x114x⅛ inches, Silver-Plated, 1 oz. per square foot, mounted upon tables with mercury traps attached.
1 Retort 4½x5½x7 inches deep, complete with Cover, Wedge and Condensing Pipe.
2 6-foot Vanners with Plain Belts.
1 50 H. P. Portable Boiler.
1 10 H. P. Vertical Engine for Crusher.
1 5 H. P. Engine for Vanners.
1 Injector.
1 Boiler Feed Pump.
All Pipe and Fittings for Steam and Water Supply for Boiler, Injector, Pump, Engines and Stamps.
38 Feet 7-inch, 4-ply Rubber Belt.
36 Feet 7-inch, 4-ply Rubber Belt.
42 Feet 6-inch, 4-ply Rubber Belt.
32 Feet 6-inch, 4-ply Rubber Belt.
58 Feet 3½-inch, 3-ply Rubber Belt.
22 Feet 1 15/16-inch Shafting, 3 Pillow Blocks, 5 Pulleys.
6 Feet 2 15/16-inch Shafting, 2 Pillow Blocks, 3 Pulleys.
1 Set of Building Bolts.
4 Extra Cast Steel Boss Heads.
8 Extra Forged Steel Stamp Shoes.
8 Extra Forged Steel Stamp Dies.
2 False Bottoms for Mortar.
12 Extra Sets Screens.
2 Extra Sets Screen Frames.
10 Pounds Imperial Packing.
1 Square Yard Rainbow Packing.

Plate 4318



CONCENTRATION MILL

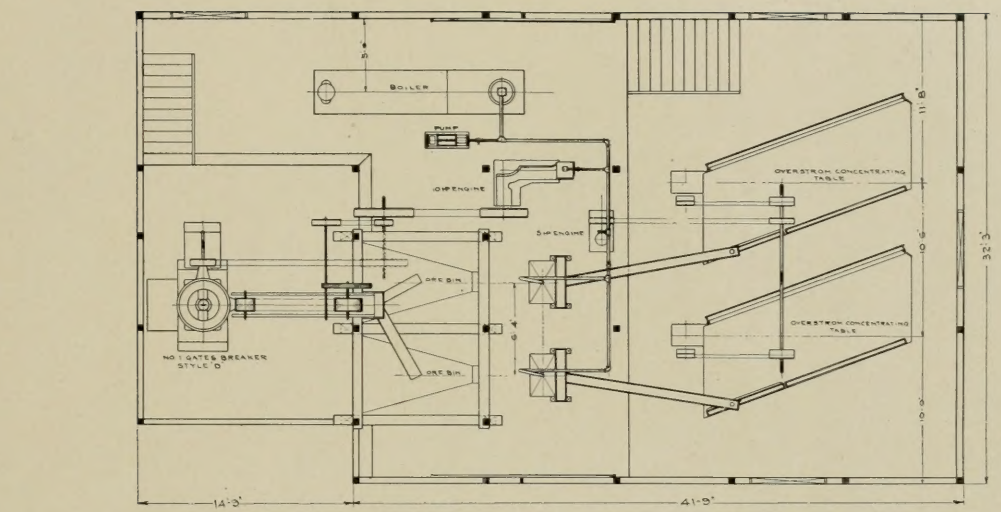
DESCRIBED ON PAGE 28

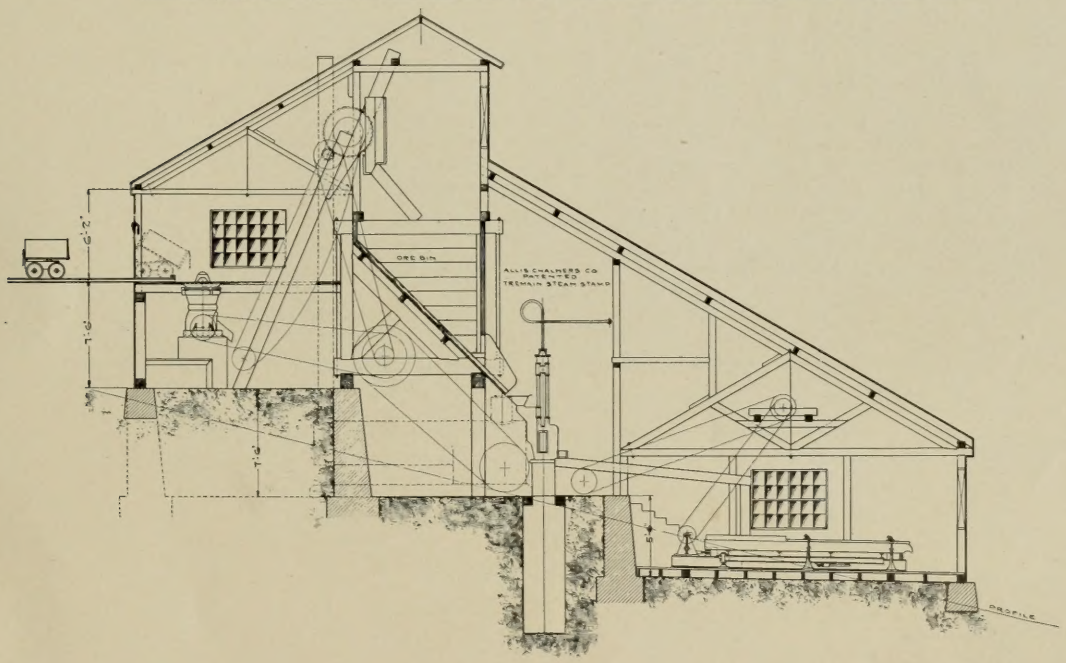
FINE CONCENTRATION MILL

TREMAIN STEAM STAMPS AND OVERSTROM CONCENTRATING TABLES

PLATE 4319

1 No. 1 Gates Breaker, Style "D".
1 No. 2 Gates Elevator.
2 Tremain Steam Stamps with Feeders.
2 Overstrom Concentrating Tables.
1 10 H. P. Vertical Engine for Crusher.
1 5 H. P. Vertical Engine for Overstrom Tables.
13 Feet Shafting, 3 Pulleys, 3 Pillow Blocks, $1\frac{15}{16}$ inch.
6 Feet Shafting, 3 Pulleys, 3 Pillow Blocks, $2\frac{15}{16}$ inch.
38 Feet 7-inch, 4-ply Rubber Belting.
36 Feet 7-inch, 4-ply Rubber Belting.
42 Feet 6-inch, 4-ply Rubber Belting.
38 Feet 6-inch, 4-ply Rubber Belting.
58 Feet 3-inch, 3-ply Rubber Belting.
1 Set of Building Bolts.
All Pipe and Fittings for Steam and Water Supply for Boiler, Injector, Pump, Engines and Stamps.
1 50 H. P. Portable Boiler, on Skids.
1 Injector.
1 Boiler Feed Pump.
4 Extra Boss Heads, cast steel.
8 Extra Shoes, forged steel.
8 Extra Dies, forged steel.
2 False Bottoms for Mortar.
12 Extra Sets Screens.
2 Extra Sets Screen Frames.
10 Pounds Imperial Packing.
1 Square Yard Rainbow Packing.





FINE CONCENTRATION MILL

DESCRIBED ON PAGE 30

Allis-Chalmers Company

PRINCIPAL PRODUCTS

Air Brakes
Air Compressors
Blowing Engines
Crushing and Cement Machinery
Condensers
Engines—Gas and Corliss
Flour Mill Machinery
Hoists—Steam or Electric
Hydraulic Machinery
Mining Machinery
Perforated Metals
Power Transmission Machinery
Pumping Machinery
Saw Mill Machinery
Sugar Machinery
Timber Preserving Machinery
Turbines—Steam
Turbines—Water

ELECTRICAL APPARATUS

Alternating and direct current generators and motors
Switchboards for alternating and direct current
Street Car Equipments, Motors, Controllers, etc.
Transformers, Rotary Converters, etc.

GENERAL OFFICES - - - - - - - - - - - MILWAUKEE, WISCONSIN

DISTRICT OFFICES

Atlanta, Ga., Fourth Nat'l Bank Bldg.
Baltimore, Md., Continental Bldg.
Birmingham, Ala., Woodward Bldg.
Boston, Mass., 50 Congress St.
Buffalo, N. Y., Ellicott Square Bldg.
Chicago, Ill., First National Bank Bldg.
Cincinnati, O., First National Bank Bldg.
Cleveland, Ohio, Schofield Bldg.
Dallas, Texas, Wilson Bldg.
Deadwood, S. D.
Denver, Colo., McPhee Bldg., 17th and Glenarm Sts.
Detroit, Mich., Union Trust Bldg.
El Paso, Texas, 129 San Francisco St.
Kansas City, Mo., Dwight Bldg.
Los Angeles, Cal., 129-131 E. Fifth St.
Minneapolis, Minn., Corn Exchange Bldg.
New Orleans, La., Maison Blanche Bldg.
New York, N. Y., 71 Broadway.
Philadelphia, Pa., Land Title Bldg.
Pittsburg, Pa., Frick Bldg.
Portland, Ore., 92 First St.
St. Louis, Mo., Third National Bank Bldg.
Salt Lake City, Utah, Dooly Bldg., 117-119 W. 2nd South St.
San Francisco, Cal., Jackson Building, Second and Natoma Sts.
Scranton, Pa.
Seattle, Wash., 115 Jackson Street.
Spokane, Wash., Paulsen Bldg.
Toledo, O., Ohio Bldg.
Washington, D. C., Evans Bldg.

FOREIGN DISTRICT OFFICES

Guaymas, Sonora, Mexico, Apartado Num. 162.
London, England, 732 Salisbury House, London Wall, E. C.
Mexico City, Mexico, No. 407 La Mutua.

CANADIAN REPRESENTATIVES

Allis-Chalmers-Bullock, Ltd.: Works, Montreal, Que.

Offices

Montreal, Que.—Allis-Chalmers-Bullock, Ltd., 612 Canadian Express Co's. Bldg.
Calgary, Alta.—Allis-Chalmers-Bullock, Ltd.,
Cobalt, Ont.—Allis-Chalmers-Bullock, Ltd.
Toronto, Ont.—Allis-Chalmers-Bullock, Ltd., Traders Bank Bldg.
Vancouver, B. C.—Allis-Chalmers-Bullock, Ltd., Dominion Trust Bldg.
Winnipeg, Manitoba—Allis-Chalmers-Bullock, Ltd., 251 Notre Dame Avenue.

FOREIGN SALES AGENCIES

Arequipa, Peru,	W. R. Grace & Co.
Buenos Aires, Argentine Republic,	American Trading Company
Callao, Peru,	W. R. Grace & Co.
Johannesburg, South Africa,	Herbert Ainsworth
La Paz, Bolivia,	W. R. Grace & Co.
Lima, Peru,	W. R. Grace & Co.
Manila, Phillippine Islands,	Frank L. Strong
Oruro, Bolivia,	W. R. Grace & Co.
Perth, West Australia,	Frank R. Perrot
Shanghai, China,	American Trading Company
Sydney, Australia,	Messrs. N. B. Limited
Yokohama and Kobe, Japan,	American Trading Company